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ENERGY

No. 7

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ELECTRIC POWER

OVERALL VIEW OF POWER PRODUCTION FOR 1979

Moscow ELEKTRICHESKIYE STANTSII in Russian No 1, Jan 80 pp 12-14

[Article: "Power Engineering in 1979 and Tasks for the Final Year of the Five-Year Plan"]

[Text] The winter of 1978-1979 was exceptionally severe in many areas of the European part of our country. As a result brief interruptions took place in the delivery of electric and thermal power to users in a number of power systems.

But in general power engineers managed to cope with this rigorous test. The country's power system demonstrated a high level of operational reliability and provided electric power and heat to users during the entire past year.

According to preliminary data, the volume of industrial production increased by 4.5 percent in 1978 and labor productivity in the industry rose by 3.8 percent. In spite of rigorous weather conditions in a large part of the country's territory, agricultural workers raised and harvested grain and industrial crops on time.

In the country's power plants 1245 billion kilowatt-hours of electric power were generated. Its production increased by 39 billion kilowatt-hours or somewhat more than 3.5 percent compared to the volume of production in 1978.

In 1979 1022 billion kilowatt-hours (82.1 percent) of the total 1245 billon kilowatt-hours of electric power were produced by steam generating plants, 169 billion kilowatt-hours (13.6 percent) by hydroelectric power plants and 54 billion kilowatt-hours (4.3 percent) by atomic power plants.

The eastern regions of the country and the Ural region produced 38 percent of the total electric power generated or 479 billion kilowatt-hours which represents a further increase in the role of these regions in providing electric power for the USSR national economy.

The growing role of hydroelectric and atomic power plants in electric power generation should be noted, corresponding as it does to the adopted policy

and program for development of electric power engineering in the present state of development of the country's fuel and energy industry. The total electric power production in GES's [hydroelectric power plants] and AES's [atomic power plants] reached 223 billion kilowatt-hours in 1979 or 18 percent of the entire annual production volume, which is equivalent to a savings of nearly 72.5 million tons of conventional fuel. The growing role of atomic power plants both in urban heating and for industrial centers should be noted. In 1979 more than 5 million gram-calories of heat were produced from nuclear fuel.

Considering the favorable experience of these AES's, USSR Ministry of Power and Electrification has adopted a resolution to expand the use of steam from unregulable exhausts of AES condensing turbines for heating local villages, which, along with the construction of nuclear central heating plants (AST) and nuclear central heating and power plants (ATETs) will lead to further growth in the role of AES's in providing heat for the national economy and savings of mineral resources for fuel.

It should especially be noted that the country's fuel and energy balance in 1979 took shape, to a considerable degree, under conditions of an extensive movement unfolding due to the appeal the CPSU Central Committee. In the 9th Five-Year Plan alone the implementation of workers' proposals made it possible to save more than 40 billion kilowatt-hours of electric power, 40 million gram-calories of thermal energy and 20 million tons of conventional fuel. In the 10th Five-Year Plan savings of fuel and energy resources will be even larger.

Electric power engineering personnel are also making their contribution to conserving fuel and energy resources. According to preliminary data, the relative consumption of fuel in thermal power plants in 1979 in a conditional estimate of electric power delivery amounted to 330 grams per kilowatt-hour with a target of 329 grams per kilowatt-hour and in a heat supply estimate to 173.1 kilograms per gram-calorie with a target of 172.9 kilograms per gram-calorie. Compared with 1978 the relative fuel consumption in electric power generation was reduced by 1.0 gram per kilowatt-hour due to a further increase in the share of electric power generated by 160-800 magawatt power units and an increase in the electric power generated by TET's [heat and power central] for heat users.

The staffs of Kostromskaya, Sredneural'skaya, Reftinskaya, Iriklinskaya GRES's [State regional electric power stations] and a number of other thermal power plants achieved the best results in the sector in reducing the relative fuel consumption and in obtaining fuel savings beyond the plan. The total savings of conventional fuel by all the TES's of USSR Minenergo [thermal power plant] in 1979 compared with the relative consumption in 1978 amounted to 0.9 million tons.

The demand for electric power in 1979 (by sector) of the national economy is shown in the following: industrial and construction -- 698 billion kilowatt-hours (56 percent of the total), transport -- 97.2 billion kilowatt-hours

(7.8 percent), agricultural -- 103 billion kilowatt-hours (8.3 percent), communal and general urban services -- 149 billion kilowatt-hours (12.0 percent) and in-house needs of electric power plants and losses in networks -- 182.6 billion kilowatt-hours (14.7 percent).

In the past year as in previous years of the 10th Five-Year Plan, the demand for electric power in agriculture and in urban communal and general sectors has grown at the most rapid rate.

The demand for thermal power from centralized heating sources increased in 1979 by 96 million gram-calories; of them 845 million gram-calories or 39 percent of the total volume of centralized heat delivery were supplied by heat and electric power plants and rayon boiler houses of USSR Minenergo.

New machinery was put into operation at the following condensation electric power plants: in Ekibastuzskaya GRES-1 -- 500 megawatt power unit No 1, in Reftinskaya GRES -- 500 megawatt power unit No 9, in Stavropol'skaya GRES -- 300 megawatt power unit No 6, in Iriklinskaya GRES -- 300 megawatt power unit No 8, in Surgutskaya GRES -- 210 megawatt power units No 10 and 11, in Gusinoozerskaya GRES -- 210 megawatt power unit No 4, in Maryyskaya GRESS -- 210 megawatt power unit No 5 and others.

New central heating equipment was put into service at TETs No 25 of Mosenergo -- the first 250 megawatt T-250 power unit, at Novo-Sterlitamakskaya TETs -- 135 megawatt power unit No 3 and at Volgodonskaya TETs No 2 -- 110 megawatt power unit No 2. Central heating turbines with 50 megawatt capacity were installed at Kirishskaya, Ust'-Ilimskaya, Permskaya TET's and others.

The third power unit of the Leningradskaya AES with a 1 million kilowatt RBMK-1000 reactor has gone on line.

New hydraulic equipment has been installed in the Sayano-Shushenskaya GES -- 640 megawatt units No 2 and 3, in Ust'Ilimskaya GES -- 240 megawatt unit No 16, in InguriGES -- 260 megawatt unit No 4 and in Nurekskaya GES -- 300 megawatt unit No 9. The first units with 78 megawatt capacities have been put into operation at Nizhnekamskaya GES and so on. With unit No 9 installed in 1979 the Nurekskaya GES has reached its planned capacity of 2700 megawatts.

Along with the installation of new equipment in 1979 the available power of electric power plants was also increased due to the elimination of power failures and reconstruction of equipment. The available power of USSR Minenergo heat and electric power plants alone has been increased by more than 1 million kilowatts due to measures to eliminate gaps between rated and available capacities. At the Bratskaya GES reconstruction and modernization of units has been completed as a result of which their useful performance factor has been increased by 1 percent, providing additional annual electric power generation of 200 kilowatts.

With the introduction of new power capacities the total rated power of the country's electric power plants at the beginning of 1980 reached 261 million kilowatts, of them 52.6 million kilowatts (20.1 percent) from hydroelectric power plants and 12.54 million kilowatts (5.0 percent) from nuclear power plants.

Further concentration of electric power production has been continued. The Reftinskaya GRES has reached 3300 megawatts of power, Iriklinskaya GRES 240 megawatts, Ust'-Ilimskaya GES 3840 megawatts, Sayano-Shushenskaya GES 1920 megawatts and so on.

A considerable amount of work was done in 1979 on the construction of new electric power networks. The construction of new electric power transmission lines with 220-750 kilovolts had the goal of providing a power supply to large electric power plants under construction and being expanded, of increasing the efficiency and reliability of the power supply and of providing electric power to developing regions economically important to the country such as Tyumenskaya oblast, the Baykal-Amur Main Line zone, Uzbek SSR and others.

The most important new electric power transmission lines put into service in 1979 are: Leningradskaya AES to Leningrad, Kurskaya AES to Novo-Bryanskaya substation and Chernobyl'skaya AES to the Rovno urban area (temporarily 330 kilovolts)with 750 kilovolts; 500 kilovolt lines from Syrdar'-skaya GRES to Guzar, Reftinskaya GRES to Kozyrevo, Omsk to Petropavlovsk; 220 kilovolt lines from Zavodskaya to Zainskaya GRES's, Kirov to Murashi, Nizhneangarsk to Muyakan, Nyurengrinskaya GRES to Tynda and others.

In 1979 as in previous years of the 10th Five-Year Plan, large numbers of new 110-35-20-10-6-0.4 kilovolt electrical networks were constructed for agricultural electrification.

The total extent of 35 kilovolt and higher electric power transmission lines was increased in 1979 by 34,000 kilometers and reached 703,000 kilometers by the end of the year. During the same year the extent of 0.4-20 kilovolt agricultural power transmission lines alone was raised by 110,000 kilometers and reached 3,700,000 kilometers.

The development of electrical networks of all voltages in 1979 was extended to the borders of the Integrated Electric Power System (EES) of the USSR. At the end of last year networks of USSR EES encompassed a territory with a population of more than 210 million people. The total power of its electric power plants reached 202.6 million kilovolts (82.3 percent of the power of all electric power plants of the USSR) while the annual electric power production was 1064 billion kilowatt-hours (89 percent of all electric power generated in the USSR).

Power engineers of the USSR and the Hungarian Peoples' Republic gave great emphasis again in 1979 to operational exploitation of the 750 kilovolt electric power transmission line installed from Vinnitsa to Zapadino-Ukrainskaya substation to Al'bertirsha. This electric power transmission line constructed in accordance with the Comprehensive Program for Socialist

Economic Integration of CEMA countries substantially increased the reliability of electrical connections of the power systems of these countries and widened opportunities for mutual exchange of electric power.

Power engineers are faced with great problems in 1980, the concluding year of the 10th Five-Year Plan. In this year Soviet power engineers and the entire country will celebrate an important event in the history of our country's electrification -- the 60th anniversary of Lenin's GOERLO Plan [State Commission for the Electrification of Russia].

Uninterrupted provision of electric and thermal power for the national economy is the main task of power engineers in the approaching year. In accordance with the approved plan for development of the country's national economy in 1980, 1295 billion kilowatt-hours of electric power and 2260 million gram-calories of thermal power should be generated, of them 1200 billion kilowatt-hours (92.6 percent) and 877 million gram-calories (33.7 percent) by USSR Minenergo.

In 1980 electric power production will increase by 50 billion killowatt-hours or 4 percent compared with the actual production in 1979 and by 90 million gram-calories, also 4 percent. Measures will be carried out to further reduce the relative consumption of fuel in generating electric and thermal power. The relative consumption of fuel in the conditional estimate of electric power provision is scheduled to be reduced in 1980 to 327 grams per kilowatt-hour and 172.6 kilograms per gram-calorie in the heat provision estimate. As a result 3.6 million tons of conventional fuel will be saved annually.

A total of 14.5 million kilowatts of new power is scheduled to implement the plans for electric and thermal power production in 1980. Of them 7.5 million kilowatts (51.7 percent) will be generated at heat and electric power plants, 4.9 kilowatts (33.8 percent) at nuclear power plants and 2.1 million kolowatts (14.5 percent) at hydroelectric power plants.

In the plan for development of steam generating plants, introduction of the following condensing equipment is planned: the first 1200 megawatt power unit in our country at Kostromskaya GRES, 800 megawatt power unit No 5 at Ryazanskaya GRES, 500 megawatt power unit No 10 at Reftinskaya GRES, 500 megawatt power units No 2 and 3 at Ekibastuzskaya GRES-1, 210 megawatt power unit No 12 at Moldavskaya GRES, 210 megawatt power unit No 12 at Surgutskaya GRES and others.

Central heating equipment is scheduled to be installed at the following electric power plants: a 250 megawatt power unit at TETs-25 of Minenergo (unit No 4) and the same size unit at Yuzhnaya TETs of Lenenergo (unit No 1), central heating turbines with 120 megawatt capacity at Khar'kovskaya TETs-5, Novocheboksarskaya TETs-3 and Penzenskaya TETs, 110 megawatt turbines at Volgodonskaya TETs-2 and Petrozavodskaya TETs, 100 megawatt turbines at Novo-Sterlitamakskaya TETs and Tallinskaya TETs-2 and others.

There are plans to place new equipment in nuclear power plants: 1 million kilowatt units with RBMK-1000 type reactors at Smolenskaya and Chernobyl'skaya AES's (reactor No 3) and Leningradskaya AES (reactor No 4), after which the Leningradskaya AES will reach planned capacity of 4 million kilowatts and will become the most powerful AES operating in the country, 440 megawatt units with VVER-440 type reactors at Kol'skaya AES (reactor No 3) and at Rovenskaya AES and with VVER-1000 type reactors at Yuzhno Ukrainskaya AES.

New hydraulic equipment will be put into service at the following GES's: Sayano-Shushenskaya -- 640 megawatt units No 4 and 5 and 260 megawatt unit No 5 at Ingurskaya, after which this GES will reach planned capacity of 1640 megawatts, 215 megawatt unit No 6 at Zeyskaya, after which this GES will reach planned capacity (1250 megawatts), 104 megawatt units No 7 and 8 at Dneproges, completing the installation of the GES's planned capacity, unit No 1 at Kolymskaya GES and others.

Construction of about 35,000 kilometers of 35 kilovolt and higher electric power transmission line is scheduled in the plan for development of power engineering in 1980 along with more than 160,000 kilometers of 0.4-20 kilovolt electric power line to cities and rural areas, 43,000 kilometers of them for replacing worn out overhead lines.

The most important of these electric power lines are: 750 kilovolt --Smolenskaya AES to Novo-Bryanskaya substation and Chernobyl'skaya AES to Zapadno-Ukrainskaya substation; 500 kilovolt -- Surgut to Dem'yanskoye (second line), Maryyskaya GRES to Karakyl', Kostromskaya GRES to Vologda, Ryazanskaya GRES to Tambov; 220 kilovolt -- Frunzenskaya to Bystrovka, Ekibastuz to Tselinograd, along the oil pipeline from Surgut to Polotsk, for electric power provision to the Baykal-Amur Main Line and others.

Power engineers are faced with great problems in 1980 in implementing the resolution of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing the Efficiency of Production and Work Quality. The specific nature of electric power engineering, distinguished by the dependence of production on a large number of external factors, large capital consumption and large relative importance of actual labor in the net cost of energy, is responsible for the complexity in solving such problems and requires a thoughtful and systematic approach to developing actual indicators in planning the sector's activity, measures to speed up the introduction of power producing equipment and an increase in the effectiveness of capital investments, the development of cost accounting and economic controls and stimuli.

In addition, automated enterprise control systems (ASUP's) must be further developed, data processing systems developed and improved and the level of centralization of the control functions in power systems increased.

One of the main tasks of power engineers in 1980 will be to further increase the reliability of power system operation, to promote fuel and electric power conservation and to strengthen the monitoring of efficient electric and thermal power use by consumers.

Special attention should be given to the problem of reducing thermal energy loss, since less attention is customarily given to it than to the subject or reducing electric power loss although the thermal energy resources of the economy are as yet only poorly utilized. It is necessary to expand the secondary use of resources of thermal energy and, in particular, the use of heat from ventilation exhausts of industrial enterprises and public buildings. In this case the favorable experience of the staffs of plants of the Ministry of the Electronics Industry deserves attention. To further reduce the consumption of mineral fuel in the European part of the country, it is necessary to make more extensive use of heat from waste materials of the turbines of nuclear power plants and also to construct the first nuclear heating plants and nuclear heat and electric power plants at a more rapid rate.

Modernization of power equipment and elimination of existing power failures are important and economically effective measures for increasing available power of electric power plants. The development and incorporation of such measures along with measures to accelerate the introduction and exploitation of new power producing equipment should be considered one of the main tasks of power engineering.

New large-scale and critical problems have been presented to power engineers in the program speech of comrade L.I. Brezhnev at the November (1979) Plenum of the CPSU Central Committee and in the Law on the State Plan for Economic and Social Development of the USSR in 1980 adopted by the 2nd Session of the USSR Supreme Soviet, 10th Convocation.

Successful implementation of the tasks of the final year of the 10th Five-Year Plan is a worthy task for all power engineers.

8945
CSO: 1822

ELECTRIC POWER

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SEMINAR ON FUEL TRANSPORT TO KAZAKHSTAN ELECTRIC POWER FACILITIES

Moscow ELEKTRICHESKIYE STANTSII in Russian No 1, Jan 80 pp 74-75

[Article by engineers O.F. Rayfel'd and B.M. Utkin in the column "In the Central Administration of the Scientific and Technical Society of the Energy and Power Industry": "Seminar on Management of the Operation of the Fuel Transport Industry for the Electric Power Plants of Kazakhstan"]

[Text] A republic seminar was held in Ust'-Kamenogorsk by republic and Eastern Kazakhstan administrations of the Scientific and Technical Society of the Energy and Power Industry (heat engineering sections). Participating in it were specialists from Kazakh SSR Minenergo [Ministry of Power and Electrification], rayon power administrations of Amla-Ata, Ust'-Kamenogorsk, Aktyubinsk, Karaganda, Pavlodar, Tselinograd, Chimkent, Krasnoyarsk, Kemerovo, Frunze, planning and scientific research institutes (Novosibirskoye division of the All-Union State Institute for the Planning of Electrical Equipment for Heat Engineering Installations and the Ural All-Union Institute of Heat Engineering im. F. E. Dzerzhinskiy) and finish work organizations (Soyuzenergo planning section, its divisions and the Kazenergonaladka republic specialized production enterprise)--a total of 24 organizations.

Chief engineer of the Economic Planning Department of Altayenergo L.T. Baturov opened the seminar. Director of the industrial division of Vostochno-Kazakhstanskaya oblast committee of the Communist Party B.P. Attronov welcomed the participants.

More than 20 papers and reports were heard and discussed on the state of fuel transport shops of the Kazakhstanskaya TES's [thermal power plants], on management of operation and reliability of equipment operation, on the subject of fuel accounting, its flow in the preparation process, crushing, removal of extraneous impurities (metal, wood), automation and prevention of dust in fuel-handling compartments.

Seminar participants noted that, with the growth in capacity of thermal electric power plants during past years, the absolute consumption of fuel by powerful TES's has increased considerably reaching, at present, 30,000-40,000 tons per day. Because of this, the problem of increasing the reliability of fuel provision is becoming ever more urgent.

The majority of domestic fuel-handling shops of Kazakhstan's electric power plants have been supplied with new equipment. For instance, car dumpers with crushing and cutting machinery and mounted jigs have been set up to unload fuel from cars at large electric power plants. All fuel depots have been equipped with bulldozers and cranes and the fuel-handling equipment is run from a control panel. Many electric power plants have done a large amount of work on improving the installed equipment and the management of the operation.

The book "Toplivno-transportnoye khozyaystvo teplovykh elektrostantsii" [Fuel Transport to Thermal Power Plants] and data on planning and operating fuel-handling departments were prepared and published by scientific research and planning institutes as well as the planning section of Soyuztekhenergo.

Seminar participants had the opportunity to become acquainted with the high level of operation management and various engineering innovations in the fuel-handling process of the Ust'Kamenogorskaya TETs [heat and power central]. A display of books, maganizes, records, informational leaflets, pamphlets, operating plans and explanatory notes on the fuel-handling shop subject area was organized in the library.

However, in spite of the favorable experience, the situation arrived at in these shops by planning and finishing work organizations and electric power plants remains complicated. During the flow of the autumn and winter maximum there are disruptions in the steady supply of fuel to the untreated coal hopper (BSU) and repeated idle time of MPS [Ministry of Railroads, USSR] cars during unloading, frequent breakdowns of the dust removal system due to the penetration of extraneous objects, poor management of accounting of fuel tonnage, a high dust content and difficult working conditions. Existing arrangements for fuel-handling are complicated and inconvenient; the equipment used has low productivity and low performance as a result of which a high labor cost for operation and maintenance is observed. General-purpose railroad cars are used for transporting fuel, which leads to more metal and wood falling into it. The use of a hammer crusher for fuel crushing does not satisfy technical operation rules.

For some time past, work on automating fuel handling has been noticeably accelerated. Sibtekhenergo enterprise along with the Tashkentskiy division of the Scientific Research and Planning Institute for the Underground Gasification of Fuels are installing in the Yermakovskaya GRES [State regional electric power plant] automatic equipment for loading untreated coal hoppers (AZB) made by the Sredazelektroapparat plant. The Work Program on Automation of Fuel Handling of the Main Coal-Operated Electric Power Plants of Kazakhstan has been developed and is beginning to be implemented by the Kazenergonaladka enterprise and the Ural'skiy Affiliated Scientific Research Institute.

Developments aimed toward insuring more efficient utilization of the fuel-handling process and its reliability are being made by the indicated organizations; among them is planned the introduction of small-scale devices to protect hoppers from overfilling and to detect malfunctions of electrical equipment of the control units of automatic fuel-handling equipment.

Seminar participants considered it necessary to focus the attention of planning and scientific research institutes, finish work organizations and power systems on a basic problem which demands top-priority solution--the performance of scientific research work, according to a unified coordinated plan, on improving fuel-handling design associated primarily with increasing reliability and simplifying the arrangements for receiving, preparing and handling fuel in untreated coal hoppers, developing and putting into operation crushing equipment and protecting equipment from abrasive wear.

In the opinion of conference participants, special emphasis should also be given to the problem of fire and explosion safety in fuel-handling compartments.

Seminar participants recommended that the following experiences be widely emulated for the purpose of improving the operation of fuel transport departments:

Ust'Kamenogorskaya TETs -- in increasing operation management and reliability of equipment operation and in improving labor conditions in fuel-handling compartments;

Pavlodarskaya TETs-1 -- in introducing complete dust removal into the fuel-handling process including meticulous sealing of units for pouring, recirculation, suction, conveyor belt cleaning and rinsing;

Balkhashskaya TETs -- in adopting systems for fire extinguishing and for defrosting equipment for unloading fuel that has frozen in the cars;

Irkutskaya TETs-10 -- in putting small particle recovery equipment into operation;

Troitskaya GRES -- in improving the design of disk-toothed crushers, car pushers with thyristor control, defrosting equipment and pulley magnet operation;

Reftinskaya GRES -- in managing the operation of crushing and milling equipment and defrosting devices;

Alma-Atinskaya TETs-1 -- in reconstructing side car dumpers and the drum screen facility.

Participants gave a high rating to the level of organization of the seminar by the Kazakh republic and Eastern Kazakhstanskaya oblast Administration of the Scientific and Technical Society of the Energy and Power Industry.

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IMPROVING ELECTRIC POWER DELIVERY TO RURAL AREAS

Moscow SEL'SKOYF KHOZYAYSTVO ROSSII in Russian No 12, 1979 pp 2-4

[Article by director of the Main Administration of Power Engineering and Electrification of the RSFSR Ministry of Agriculture V. Tveritnev: "Improving Power Service to the Rural Area"]

[Text] Power available per productive unit is the most important condition for dynamic growth of social production including agricultural production. And it must be said that in the period since 1965 great changes have taken place in electrification of the agriculture in the RSFSR. In the onehundred years since the birthday of V. I. Lenin, electrification of all homes of kolkhoz farmers, workers and sovkhoz employees has been completed on the whole while 98 percent of rural electric power is obtained from state power sources. The consumption of electric power of kolkhozes and sovkhozes of our republic for production purposes during this time has had a 5.3-fold increase and reached 30 billion kilowatt hours. Practically no industrial operation is accomplished today without using electric power. It is noteworthy that the increase in electrical capacity during the current five-year plan will exceed the total power of all power sources available to agriculture in 1965.

Imparting great significance to acceleration of comprehensive electrical mechanization of agricultural production and improvement of labor and living conditions of the rural population, the CPSU Central Committee and the USSR Council of Ministers have adopted a resolution "On Measures for the Further Development of Agricultural Electrification." Putting it into practice, the RSFSR Ministry of Agriculture, local agricultural institutions, kolkhozes and sovkhozes are performing a large amount of work on the development of reliable electrical engineering to the rural area and their reinforcement with qualified personnel. Following the example of Vologodskaya oblast and Krasnodarskiy kray republic, kray and oblast interfarm Sel'khozenergo industrial power associations staffed now by 40,500 people have been set up in 38 autonomous republics, krays and oblasts.

Last year the Sel'khozenergo associations and enterprises accomplished a large amount of work on preparation of the electrical engineering part of the hardware for feed provision, crop harvesting and preparation of livestock farms for the winter penning period. In particular, they prepared 2,810 vitamin and grass meal units, 3,980 mechanized feed plants, 9,145 grain cleaning and drying stations and put in 900 artesian wells and 400 boiler works. Due to the introduction of a system of scheduled preventive maintenance and servicing of the electrical equipment, the breakdown of electric motors alone was reduced from 18-20 to 4-5 percent in Krasnodarskiy kray, Kurganskaya and Omskaya oblasts. It is difficult to overemphasize the significance of such an occurrence. In fact, if the breakdown rate of electric motors in the entire Russian economy were reduced one percent in all, it would be equivalent to 51 percent of the funds allocated for new electric motors per year. That is why it is necessary to develop stations and posts for technical maintenance of electrical equipment in each kolkhoz and sovkhoz and in large livestock associations and a reliable production base in rayon Sel'khozenergo production and operation enterprises. Sel'khozenergo agricultural departments and associations in Krasnodarskiy and Altayskiy krays, Rostovskaya, Vologodskaya and several other oblasts are doing just that.

But in the Vladimirskaya, Lipetskaya, Gor'korskaya, Ul'yanovskaya, Orenburgskaya, Chitinskaya and Kemerovskaya oblasts and Buryatskaya and Kabardino-Balkarskaya ASSR's not one rayon Sel'khozenergo interfarm production and operation enterprise has been organized and the kolkhozes and sovkhozes are poorly staffed with electricians.

It would be desirable to dwell in somewhat more detail on the training of highly-qualified electrician crews. Interesting experience was acquired in Rostovskaya oblast. Four month electrician training courses with a throughput of 16 people per year were organized in four rayon Sel'khozenergo production and operation enterprises--Azovskiy, Tatsinskiy, Morozovskiy and Millerovskiy. The program provides for two months of theoretical study and the same of practical study. And from the very beginning of the organization of these courses this task has been set: to attract the maximum available personnel of rayon centers and industrial enterprises and instituions located here. On the whole the kolkhozes, sovkhozes and interfarm Sel'khozenergo enterprises receive 260 trained specialists every year.

A program for training and updating the qualifications of engineers and electricians until 1985 was developed and put into practice by the Azovo-Chernomorskiy Institute for Mechanization and Electrification of Agriculture. The oblast Sel'khozenergo association on contract with this Institute has sent 40 scholarship students for training. In addition, refreser courses for engineers and electrical technicians having special education was organized with the Institute. To train electricians it is apparently necessary to use industrial technical schools and courses in the Minenergo rayon power administration as well as to train them in oblast Sel'khozenergo bases.

One of the main problems associated with improvement of the operation of electrical engineering service to the rural area is the efficient management of materials and equipment supply. During the past two years a number of centrally allocated materials have been selected by Sel'khozenergo associations and enterprises for service work production: black cables, lighting flex, cab-tire and power cable and electric motors with various capacities. The Ministry has furnished them with trucks and passenger cars, metal for manufacturing special equipment and instruments on a centralized basis. Thus, at the Permskiy motor vehicle repair plant Goskomsel'khoztekhnika, the MTP-817E has been manufactured in 200 electric motor types since 1978. The Rostovskoye Sel'khozenergo association has begun to manufacture Elektrosluzhba-2 electronic equipment based on the IZh-2715 vehicle. Preparatory work is being done on manufacturing special cages for electrician crews and remote towers.

It should be especially noted that the Vologodskoye, Rostovskoye, Omskoye, Novgorodskoye, Bashkirskoye and a number of other associations have organized the fabrication of cab-tire and power cable, distributing boxes, NSP-0.3 X 60 type lamps for receptacles and other items at existing industrial sites. If such examples could only indicate the importance of these measures. Goskomsel'khoztekhnika is altogether failing to allocate lamps for operating needs to kolkhozes and sovkhozes at a time when the associations are manufacturing by their own efforts about 750,000 for them this year. The Vologodskoye association has reprocessed caprone by-products to fabricate plastic substances. Just last year about 1000 kilometers of AVVG cable was manufactured and the demand of kolkhozes and sovkhozes of the oblast for it was met completely.

A considerable amount of attention should be given by the power production service in the rural area also to increasing the reliability of the power supply. Everything depends on this. In spite of the amount of work done by Minenergo enterprises and organizations to improve the electric power supply, emergency and scheduled power shutdowns are being reduced slowly while in a number of power systems their number is even growing. Again, the circuits of electrical networks are impaired by many defects. Only 30 percent of substations of agricultural designation with 35-110 kilowatt power are equipped with a two-phase power supply. A large part of the 6-10 kilowatt lines do not have redundancy and their stretch considerably exceeds the optimum.

Thus, in 1978 in the kolkhozes and sovkhozes of Pskrovskaya oblast there were 2,738 unplanned and emergency shutdowns totalling 37,835 hours with an average duration of 14 hours for a single disconnection. Such a situation with the present level of knowledge in agricultural production is intolerable since long disconnections of poultry plants, breeding complexes and farms and hot houses combines inflict uncompensated material damages. That is why one of the vital tasks of the power production service consists of developing and carrying out jointly with power supply organizations in 1980-1985 measures to increase the reliability of power provision to all agricultural targets.

The Sel'khozenergo associations and enterprises, the power production service of kolkhozes and sovkhozes and other agricultural enterprises and organizations should have taken specific and concrete steps to construct and reconstruct projects, to know their required power and, depending on them, to compose jointly with power supply and planning organizations a future plan for constructing electric power transmission lines and substations or reconstructing them. However, for now only a few Sel'khozenergo associations (Bashkirskoye, Krasnodarskoye and Vologodskoye) are doing this kind of work.

The power production service is obliged to perform a large amount of work on the introduction of new methods and technology. Valuable experience in the use, for instance, of electric heater floors and panels has been gained by the Krasnodarskoye, Bashkirskoye, Chelyabinskoye, Pskovskoye, Udmurtskoye and a number of other associations. In such places there are practically no losses of young stock. Livestock weight gain has been increased and feed consumption decreased. In particular, in Krasnodarskiy kray about 20,000 sows have been placed in rooms with electrically heated floors; in livestock breeding accomodations more than 1,200 electrode boilers and 17,000 infrared and ultraviolet irradiators have been installed. In kolkhozes and sovkhozes of Bashkir SSR 360 pig sties and farrowing pens are in service. The annual economic impact is about 200 million rubles.

The use of non-peak electric power for industrial purposes as well as electric heating with automated heat storage facilities has a great national economic value. The adoption of these methods is making it possible to increase the consumption of electric power in thermal processes without reconstructing the existing electric power supply system. To solve the problems posed, mass production of new electric heating facilities and an increase in the production of presently available ones is planned to begin in 1982.

In a number of autonomous republics, krays and oblasts little attention has been given yet to electrical network construction on the part of local agricultural associations and their power production service. Cases occur of untimely presentation of planning and estimate documentation for the main contract organization Glavsel'elektroset'stroy as a result of which a portion of the items subject to introduction is not included in the yearly plans. I will give a few examples.

The Stavropol'skoye kray administration of Agriculture claimed construction and installation work on a 0.4 kilovolt overhead line at 2.6 million rubles but the technical documentation for the beginning of 1979 only showed 1.8 million rubles. The Tul'skoye oblast agricultural administration had 746,000 and 24,000 respectively while Bryanskoye oblast agricultural administration had 2.5 million and 650,000 rubles. Monitoring the execution of assignments on the construction of low-voltage networks in Irkutskaya and Omskaya oblasts and the Karelian ASSR has been slackened.

In the 11th Five-Year Plan it is planned to carry out a considerable amount of work on the construction and reconstruction of rural electrical networks, reinforcing the industrial base of producing and construction and installation enterprises and organizations of USSR Minenergo. Beginning in 1981, construction in kolkhozes and in interfarm enterprises (organizations) of electric power transmission lines with 0.4 kilowatt power up to entry into industrial sites, targets of cultural and general designation and the homes of kolkhoz farmers and also of transformer substations with 35-10-6/0.4 kilovolt capacity connected to the state power systems should be accomplished with state capital investments. After completion of construction the indicated electric power transmission lines and substations will be converted to an established sequence for distribution to organizations of the USSR Minenergo system. This measure will permit kolkhozes and inter-kolkhoz enterprises (organizations) to generate approximately 25 million rubles worth of kolkhoz capital every year.

The steady growth of power available per productive unit in kolkhozes and sovkhozes as well as the development of progressive new methods have created favorable conditions for automating not only the individual processes and operations but for complete automation of shops and agricultural enterprises. Science is called upon to pay the most vital role in this. To accelerate introduction of completed scientific research, planning and design work in oblasts, krays and autonomous republics, introduction departments engaged in electrification problems are being set up. For instance, such departments have been set up by the NIPTIMESKh [expansion unknown] Institute for Nonchernozem Zones in the Vologodskaya, Pskovskaya, Arkhangel'skaya and Leningradskaya oblasts. It is true that they do not yet completely meet the demands of the economy with respect to introducing new methods.

The expansion of specialization, concentration and interfarm cooperation in the production of agricultural produce on an industrial basis has required a considerable expansion of work on the use of thermal energy in agricultural production, the automation of industrial processes and improvement of the operation of boiler facilities. Here, the primary source of thermal energy consumption remains livestock breeding which consumes about 65 percent of all the heat produced (about 25 percent is used for communal and general needs and the remaining 10 percent for other purposes). The thermal industry of kolkhozes and sovkhozes represents a mixed sector of power engineering. However, its operation is at a lower level. Local agricultural associations pay little attention to this problem.

At the same time, for maintenance of thermal equipment of kolkhozes and sovkhozes in good technical working order, it is necessary to do repair work and technical servicing on it in the amount of 750 million rubles per year. We suggest that interfarm enterprises and Sel'khozenergo associations undertake this work on a measure to develop and strengthen the production base. There is already experience in this in the Moskovskaya oblast, Bashkirskaya ASSR and Krasnodarskiy kray.

In the resolution of the CPSU Central Committee and the USSR Council of Ministers "On Measures for Further Development of Agricultural Electrification" are outlined concrete measures for improving the activity of power production services in the rural area. Agricultural associations are called upon to establish strigent monitoring of the execution of targeted plans and to give all possible help to labor collectives in carrying out the assigned tasks.

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AWARDS CONFERRED BY DECREE IN MOLDAVIAN SSR

Honored Power Engineer Title Awarded

Kishinev SOVETSKAYA MOLDAVIYA in Russian 22 Dec 79 p 3

[Ukase of the Presidium of the Supreme Soviet of Moldavian SSR "On the Conferring of the Honorary Title of Honored Power Engineer of the Moldavian SSR on Comrades I. M. Pavlovskiy and A. M. Soltan"]

[Text] For services in the development of power engineering and electrification in the republic, for increasing the reliability of the power supply, for improving management, introducing progressive labor methods and participating actively in public life, the honorary rank of honored power engineer of the Moldavian SSR is conferred on:

Ivan Maksimovich Pavlovskiy, fitters crew leader of the Administration of Production and Industrial Procurement of the Moldelektroset'stroy trust;

Anastas Minayevich Soltan, electrician of the Central Electrical Network enterprise.

Signed by: Chairman of the Presidium of the Moldavian SSR Supreme Soviet K. Il'yashenko and Secretary of the Presidium of the Moldavian SSR Supreme Soviet A. Mel'nik.

Honorary Certificate Awarded

Kishinev SOVETSKAYA MOLDAVIYA in Russian 22 Dec 79 p 3

[Ukase of the Presidium of the Moldavian SSR Supreme Soviet "On the Awarding of the Honorary Certificate of the Presidium of the Moldavian SSR Supreme Soviet to Groups of Workers of Enterprises and Organizations of the Main Administration of Power Engineering and Electrification affiliated with the Moldavian SSR Council of Ministers"]

[Text] For long and fruitful work and services in the development of power engineering and electrification of the republic, for successful implementation of plans and socialist commitments and active participation

in public life, the honorary certificate of the Presidium of the Moldavian SSR Supreme Soviet is awarded to:

Il'ya Mikhaylovich German, electrical fitter of the Dubossarskaya GES [hydroelectric power plant] of the Eastern Electrical Networks;

Valentin Yevgenyevich Klim, foreman of the Northwestern Electrical Network enterprise;

Ivan Georgiyevich Kobzak, electrician of mechanized tower No 6 of the Moldelektroset'stroy trust;

Mariya Yakovlevna Semina, controller-fitter of the Energosbyt enterprise.

Signed by: Chairman of the Presidium of the Moldavian SSR Supreme Soviet K. Il'yashenko and Secretary of the Presidium of the Moldavian SSR Supreme Soviet A. Mel'nik.

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ELECTRIC POWER

SOLVING THE PROBLEM OF CONTROLLED THERMONUCLEAR FUSION

Moscow TRUD in Russian 6 Feb 80 p 4

[Article in the column "Science Leads the Search": "A Step Toward a Thermonuclear Power Plant"]

> [Text] For almost 30 years a persistent struggle has been waged in world science, a struggle to control a thermonuclear reaction. When this problem is successfully solved mankind will be provided with energy for millions of years. TRUD correspondent I. Mosin asked one of the leading Soviet scientists academician B. B. Kadotsev to speak about recent progress of our specialists.

[Question] What direction is sciene taking toward solving the problem of using a thermonuclear reaction for the needs of the national economy?

[Answer] A new experimental facility Ogra-4 was put into service in the Institute of Atomic Energy literally on the eve of the new year. Physicists hope to achieve in it short pulses of 150-200 degree plasma with a density of up to 10,000 billion particles per cubic centimeter. The scientists are thinking of attaining such high-level results by using powerful rapid atom injectors.

Recently one module of a future 48-module Angara-4 facility was built. Angara-5 is the prototype of a pulse-type thermonuclear reactor.

Tokamak-7 is under construction. It differs from its companions in that here for the first time in the world superconducting coils are used. The first hot plasma pulses have been obtained in them.

[Question] The advance is actually taking place on a broad front. But wouldn't it be more efficient to project all forces on some one thing and to achieve the goals more quickly?

[Answer] I will give you this example. Segner's wheel was already known in ancient Greece. Water had to be poured into it or steam turned on and it would start spinning and begin to operate. But the first use of steam in industry began with rather clumsy machines. They showed that steam could work and work efficiently at that. Modern turbines use the very same principle of the reactive motion of deflected flow, but a long period of engineering development had to be undergone for them.

The development period will also be long for thermonuclear power engineering. Because of this it seems reasonable right now to conduct other studies along with the rapid advancement in a single main direction. At present, the most promising direction in thermonuclear power engineering is associated with Tokamaks. This is the main trend which the others are following. Tokamak has a real potential for obtaining a controlled thermonuclear reaction in the next decade.

[Question] Boris Borisovich, what problems must scientists actually solve right now in order to begin constructing thermonuclear reactors?

[Answer] I will name the main physical problems. A temperature of about 100 million degrees is needed for a practical thermonuclear reaction. For comparison, the temperature on the surface of the Sun is "as low as" 6000 degrees and about 20 million degrees at the center. At the Tokamak-10 facility on which construction began several years ago in the Institute of Atomic Energy, a temperature in the 10-13 million degree range is easily obtained through heating up plasma by passing current through it. Additional facilities are required to raise the temperature. Unique ultrahigh frequency radio wave generators are used for this at T-10. These generators, called gyrotrons, were developed in Gor'kiy under the direction of academician A. V. Gaponov-Grekhov.

The first experiments using the gyrotrons permitted us to raise the plasma temperature by two million degrees. Gyrotrons are one of the promising means of obtaining high temperatures.

The next condition for the occurrence of thermonuclear fusion is increasing the confinement time of the plasma along with its sufficiently great density. At T-10 the confinement time is less than a tenth of a second. For a full value reaction it is necessary to learn to contain the energy in the plasmas for the period of a second.

[Question] Right now thermonuclear research has become the target of close international cooperation. How does the joint work of specialists of various countries affect the process of scientific research?

[Answer] In 1956 academician I. V. Kurchatov gave a celebrated speech in England in which thermonuclear fusion studies were made public. Other governments have followed the example of our country. Subsequent years showed that international cooperation accelerated and expanded thermonuclear research.

In 1978 an important new step was taken in international cooperation. Soviet scientists proposed to the International Agency on Atomic Energy (MAGATE) that the efforts of specialists be consolidated and an experimental thermonuclear reactor be developed which would help demonstrate the technical feasibility of controlled thermonuclear fusion.

A working group was established in MAGATE. In it there were four representatives from the USSR, USA, Euratom countries and Japan. The group prepared a detailed report based on data presented to them by the specialists of various countries. An analysis of the degree of readiness of contemporary world science and engineering for the development of such a reactor was made in it. The physicists came to the conclusion that a real possibility exists right now for designing, developing and beginning operation of an international Tokamak reactor (Intor) as early as the beginning of the 1990's. It was determined what it should be like and what kind of results should be obtained in it. This facility may become the prototype for future power producing thermonuclear reactors. In Intor scientists intend to test the working capacity of all the reactor's delivery systems and to analyze in greater detail the processes which will take place in industrial thermonuclear facilities. Methods for breeding tritium, the fuel for sustaining a reaction, will be worked out in the reactor.

This report has received the endorsement of the Council on Thermonuclear Fusion. The Council recommended that MAGATE continue work on an international thermonuclear reactor and prepare a rought draft of the reactor by the middle of next year.

About 50 tokamak-type facilities are in operation in the entire world today. In the course of events it will be necessary to build ever more improved and more expensive facilities. For instance, right now are being built the Dzhiti-60 in Japan, Jet in England and the TFTR in the USA. All of these facilities are of the tokamak type. We have begun construction on Tokamak-15 in our country. All four facilities should demonstrate the physical feasibility of thermonuclear fusion. They will serve as a basis for developing such thermonuclear reactors as Intor. After Intor it will be possible to construct an experimental power-producing reactor, a prototype for industrial thermonuclear electric power plants.

The advantages of mutual cooperation are at hand. The process of work is being accelerated considerably and the research will cost each country less.

[Question] What do we plan to do on the thermonuclear program in our country in the near future?

[Answer] As I already said, we are beginning construction of Tokamak-15. This facility will be considerably larger than all of its predecessors. Why do we need to build ever larger tokamaks? If a thermonuclear reaction is to occur, the plasma must be maintained in a hot state for as long

as possible and the particles not allowed to disperse. The containment time of the plasma energy amounts to less than a tenth of a second. One feature of tokamaks is that the confinement time of the plasma energy in them depends directly on the size of the facility. Increasing the size of the tokamaks makes it possible to achieve an operating mode in which the confinement time is sufficiently large that the facility begins to produce energy beyond that consumed in the reaction. This energy may be converted directly into electric power and yield a real benefit to people.

In T-15 there are plans to heat plasma to 70-80 million degrees employing two heating methods simultaneously--gyrotrons and hot atom injections. In the facilities superconducting coils will be used to create a strong magnetic field. It should be mentioned that in this facility we are concentrating our attention on studying the "heart" of the plasma nucleus for future thermonuclear reactors. In T-15 all the processes taking place in the depths of the thermonuclear reactor will be studied more thoroughly and in greater detail. Tokamak-15 is the facility from which it is only two steps in all to an industrial reactor.

[Question] Can you try to look into the future a little?

[Answer] What will give mankind control of a thermonuclear reaction? There are two examples in all. With nuclear fusion of one kilogram of hydrogen isotopes 10 million times more energy is liberated than with the burning of one kilogram of coal. The deuterium stripped from ordinary water and a tenth of a gram of lithium contain as much energy as a ton of high-quality gasoline. We stand at the threshold of mastery of a practically inexhaustible source of energy.

As concerns the development of industrial thermonuclear electric power plants, I think it is possible to try to make the following predictions. In the next five years the physical feasibility of controlled thermonuclear fusion should be demonstrated. At the beginning of the 1990's a thermonuclear reactor of the Intor type could begin operation. It should show that all systems operate reliably enough that a self-sustaining reaction occurs over a long period and is controlled at a specified level. This will not be a laboratory facility but an experimental prototype for future power-producing reactors. It should demonstrate the feasibility of producing electricity and breeding tritium.

Next, seven or eight years later at this engineering and technical facility the first power-producing reactor for producing a large amount of electricity might appear. This will be the first sign of future industrial electric power plants. It will prove the engineering solutions conclusively and indicate where and how thermonuclear energy can best be used.

Following the first electric power plant no less than two dozen years will pass before thermonuclear power engineering amounts to a significant share of the country's power engineering. But in order to ascertain the potentials, advantages and deficiencies of thermonuclear power engineering we should get an actual thermonuclear reactor on hand as quickly as possible and hopefully in this century.

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NEW GENERATIONS OF REACTORS, ENGINEERS AT NOVOVORONEZHSKAYA AES

Kiev PRAVDA UKRAINY in Russian 10 Jan 80 p 1

[Article by Novosti Press Agency correspondent Yu. Sinyakov in the column "Socialist Integration in Action": "Before Start-up of the Fifth Power Unit"]

[Text] The Novovoronezhskaya AES [atomic power plant] is called the atomic academy of the CEMA [Council for Mutual Economic Aid]. Here, engineers from Bulgaria and Hungary, the GDR and Cuba, Poland and Czechoslovakia, the future leaders of nuclear power engineering, receive on-the-job training.

Very often it is possible to meet specialists from fraternal countries in the learning center's classes located in the new atomic power plant building. Future engineers and operators of nuclear electric power plants take their main examination on the training equipment. This hydraulic copy reproduces exactly the processes that take place in the third and fourth power units of the Novovoronezhskaya AES. The VVER-440 water-cooled reactors operating in them represent a single, typical series. The new AES's under construction in Hungary as well as the atomic power plants of Cuba and Poland have been based on them.

Moreover, the third and fourth power units have become the founders of a first generation of a unified family of atomic power plants under construction within the CEMA framework. The multistoried building of the next unit, the fifth, has evolved along with these power units in the Novovoronezhskaya AES area. It is representative of the second generation of the Novovoronezhskaya dynasty of atomic giants. It has a 1000 megawatt capacity.

At the present time the Novovoronezhskaya AES is in a start-up rhythm. The construction of the fifth unit is the focus of engineering and people. Here have been assembled the best skilled workers in their fields who have been responsible for such well-known atomic construction projects as those in Kol'skiy peninsula and Armenia, Kozloduy (Bulgaria) and

Yaslovske Bogunitse (Czechoslovakian SSR). Before the new reactor (VVER-1000) is put into operation there will be testing of the main units and subassemblies. The check-out crews will work without interruption, spelling one another. PUSK [Start-up] is the name given to the wall newspaper of the power engineers published at the construction site.

"The new VVER-1000 reactor is a little larger than those in operation," commented manager of the finish work operation Leonid Lavrov. "However, its power yield will be more than twice as high. The effect is achieved by simulation of the main and auxiliary equipment. Transportability is one of the most important advantages of the reactor. Its main units are manufactured in a plant and then sent to the construction site by railroad." Very soon," continues Lavrov, "not a single person will remain here, not one living soul, although the shielded reinforced concrete jacket which you see completely and with absolute reliability insulates the reactor from the surrounding environment."

A reactor of this type will become one of the main power-producing systems of the socialist collaboration states. Its use will permit the cost of electric power to be reduced 10-15 percent.

That is why the tasks of mastering it were included in the approved plan for multifaceted integrated action of the SEV countries in 1976-1980. Participating countries allocated approximately 200 million rubles for research in the field.

Their joint scientific and engineering program has been implemented successfully. Manager of the department on the use of atomic power for peaceful purposes of the SEV Secretariat Alexander Panesenko told us that the VVER-1000 reactor units, particularly the steam generators, circulation pumps and remote control valves were developed in Poland, the Soviet Union and Czechoslovakia. The miniature temperature measurement gauges in the operating zone were manufactured in the GDR, Poland and Romania. In addition, scientists of the GDR and USSR proposed the so-called noise diagnostics method for the reactors. Czechoslovakian specialists are developing pumps with a large throughput capacity for the VVER-1000 and Polish and Soviet scientists are developing monitoring systems.

After the Novovoronezhskaya AES, power units with VVER-1000 reactors will be started up at the Kalininskaya, Rovenskaya, Khmel'nitskaya and Konstantinovskaya atomic power plants. Then the Khmel'nitskaya and Konstantinovskaya AES's, each with 4,000 megawatt capacities, will become joint construction projects of the fraternal countries.

Who will produce the reactors of the new generation? The first VVER-1000 for the Novovoronezhskaya AES was manufactured by the Izhorskoye Plants Association near Leningrad. In the future the Atommash plant in Volgodonsk will be converted to line production of this type of reactor. The production of superpower equipment intended for atomic power plants of socialist collaboration states is being organized at this giant plant.

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REACTOR TESTED AT ARMYANSKAYA ATOMIC POWER PLANT

Yerevan KOMMUNIST in Russian 8 Dec 79 p 1

[Article by chief engineer of the Armyanskaya AES [atomic power plant] E. Saskov and director of the plant's production and technical department A. Muradyan in the column "Issue No 12. The Vessel is Prepared.": "Reactor Takes an Examination"]

[Text] In his speech to the November Plenum of the CPSU Central Committee Comrade L. I. Brezhnev pointed out the enormous scale of construction in our country. Among the large-scale new industrial enterprises he mentioned the Armyanskaya atomic power plant. This emphasis on the Armyanskaya AES is imposing a great responsibility on the builders, installers and operators to complete the power plant's second unit and put it into operation in good time.

A most critical period has now arrived in launching the urgent construction project--the hot testing of the equipment of loop 1. Its purpose is the field testing of all the installed systems and equipment in the circuit of the first loop with simulated operating zones. Briefly, the hot testing is actuation without nuclear fuel.

Following assembly inspection of the condition of the metal and weld joints, testing of the individual subassemblies and units, idling of the equipment and its testing under operating parameters, at a certain point the readiness and reliability of the entire unit's systems for receiving nuclear fuel are verified.

By the criterion of the hot testing there will be unconditional confirmation of the nuclear and industrial safety of all of the equipment and, primarily, that of the reactor.

In the near future we must perform hydraulic testing, check-out of the control systems of the reactor shield and measurement of the internal vessel units. All measurements are done by means of modern remote control equipment. As this is being done, the physicist operators will be preparing the nuclear fuel for loading the reactor.

In the process of inspecting the intake monitoring of the internal vessel units of the reactor, defects of various kinds were discovered in the equipment supplied by the Izhorskiy Plant Industrial Association. Necessary steps were taken by plant personnel under the direction of deputy director of the centralized repair shop of the AES R. Vlasyakiy and the mechanics and fitters crew of the Izhorskiy Plant to eliminate the defects, requiring additional expenditures of time and facilities not foreseen in the start-up schedule.

An active part in preparing the reactor and systems of the first loop for hot testing was taken by the staff of the centralized repair shop of our plant. The director of the shop E. Sarkisov and the staff of the Armenergoremont plant organized the fabrication of missing fittings and parts for the power equipment. The finish work crew of the start-up and adjustment shop of the Kol'skaya atomic power plant under the direction of engineer F. Kolo was a great help to the operating staff of the AES in conducting the hot testing.

In spite of the difficulty encountered in the process of finish work, the staff of builders, installers and operators of the Armyanskaya atomic power plant was resolved to begin construction of the second power unit during the current year.

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SECOND POWER UNIT COMPLETED AT ARMENIAN NUCLEAR POWER PLANT

Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 80 p 1

[Text] The Armenian Nuclear Power Plant was put into operation in the tenth five-year plan. Its first 405,000 kilowatt power unit provided industrial current in 1976.

The great significance of this labor victory was emphasized by comrade L. I. Brezhnev in his welcoming address to the participants in the construction: "The construction of this electric power plant is a great contribution to the implementation of the resolutions of the 25th Congress of the CPSU with respect to the support of the leading development of nuclear power engineering. It will help faster to realize the electrification of industry, agriculture of the Armenian SSR and other republics of the Transcaucasus and to increase the efficiency of social production on the basis of this."

On the eve of 1980, the construction of the second power unit was completed. The installed power of the first phase of the electric power plant reached 815,000 kilowatts. As a result of the skillful use of the accumulated experience, the concentration of forces and means, good organization of the work of the collective of the construction-installation and starting and adjustment organizations and the operators of the nuclear power plant, the times for the installation and testing of the complex equipment were reduced significantly.

From the time of starting of the first unit, more than 5.3 billion kilowatt-hours of electric power have been generated, including 54 million above the established plan. In 1979, the cost of electric power dropped by 3.4%, and more than 10 million rubles of profit were obtained.

The power plant is the first in Soviet nuclear power engineering erected in a zone of increased seismicity. The efforts of the specialists of many scientific research and planning and design organizations have developed and realized special engineering solutions which insure reliable, safe operation of power equipment under such conditions.

Growth of electric power production at the nuclear power plants

In billions of kilowatt-hours

1976	26.4
1977	34.8
1978	44.8
1979	54.8
1980 (plan)	71.9

A new, well constructed village power engineer -- Metsamor -- has been built. Its residentical capacity at the present time is 100,000 square meters. Schools, kindergartens and nurseries, trade and domestic services facilities, culture and public health facilities have been built.

Specialists from many republics, krays, oblasts and cities of our country have rendered fraternal aid to the builders involved in power engineering of Armenia. The builders and riggers of Georgia and Azerbaydzhan, Kola and Novovoronezhsk nuclear power plants have worked shoulder to shoulder with them, and the requests for equipment have been met by the machine builders of the Ukraine, Moscow, Leningrad, and other industrial centers.

In answering the call of the party to make 1980 a year of Leninist operation, the collective of the nuclear power plant has assumed high obligations. As a result of further improvement of the technical level of operation of the equipment, shortening the times required to repair it, the annual assigments for power engineering day -- 22 December -- has been fulfilled: to generate an additional 90 million kilowatt-hours of electric power, to achieve a further reduction in its cost and growth of productivity of labor. An active competition is underway for early assimilation of the designed technical-economic indexes of the operation of the second power unit.

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ELECTRIC POWER

FAST BREEDER REACTOR TO STARTUP AT BELOYARSK NUCLEAR POWER PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Feb 80 p 2

Photograph by A. Grakhov

[Text] Sverdlovsk oblast. At the Beloyarsk Nuclear Power Plant imeni Kurchatov which has already made a significant contribution to the power supply of the Urals for 16 years is ready to start up the first power unit with a 600,000 kilowatt fast-neutron reactor.

In the photograph we see a steam turbine of the third unit.

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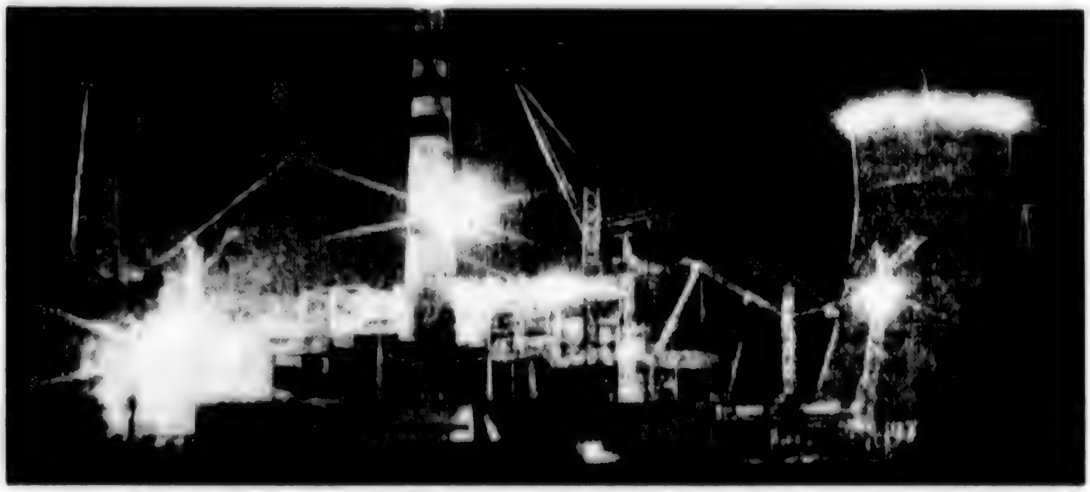
ROVENSK NUCLEAR POWER PLANT READY TO BE STARTED UP

Moscow PRAVDA UKRAINY in Russian 6 Jan 80 p 2

[Article by P. Vovk]



[Text] The Roveusky Nuclear Power Plant is now ready to start up the first power unit. I am working at the power plant as an operator for electric welding quality. The grandness of construction site is astonishing. I want it to make this photograph for the PRAVDA UKRAINY.

10,845
CSO: 1822

FORM FOR REPORTING EQUIPMENT DEFECTS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 1, Jan 80 pp 77-78

REPORT ON EQUIPMENT DEFECTS

City__________________________ Date___________19___

We, the undersigned, have composed this report on the following:

1. On ________19_____, we were given for examination _________________
equipment name
to ascertain the complaince of its performance with the specifications of the order and its technical specifications and also to determine the reasons for defects.

2. ______________________,plant number _____________________________
equipment name machines, units etc.

was supplied by the firm _____________________________, according to
name of outside supplier

contract 50/ __________, by transport ________________, at number of sites ____________, site number __________________, account number of outside supplier ______________________ from __________ 19________.

3. ______________________ arrived at the place of operation ________19___
equipment name
by international railroad with invoice number _____________________, bill of lading number ________, domestic railroad invoice number _______ without signs of damage in transit.

4. Upon receipt on ____________19 ____, ________________ was examined and
equipment name
_____ _________ ____________________ were conducted. It was set up and
measurements, tests, trial run, etc.
put into operation on ___________ 19 ______ in full compliance with instructions ____

of the outside supplier-plant (or according to the instructions of specialists of the outside supplier).

Personnel (specialists) of the receiver were familiarized with the instructions of the outside supplier at that time.

5. After operation of ______________________ for ___________ (or after
equipment name
a run of __________km) in _________hours ________min on __________ 19 ___

there occurred ____

____

A description of the circumstances of the equipment breakdown follows:

____

as a result of which _____________________________was unfit for further
equipment name
operation.

During examination of the equipment units to ascertain the causes of the defects, it was established that the malfunction occurred at _______________
indicate
____________________. As a result _____________________________________
place equipment name
____

____

____

The nonconformance of the equipment performance with specification of the order and its technical specifications, design defects, production flaws

caused by poor manufacturing, technical irregularities or inaccurate assembly are indicated.

The indicated findings are confirmed by ______________________________

____

____
conclusions of experts, records of tests, measurements, photographs, analyses, studies, parts and units removed etc.

7. ______________________ was taken out of operation ___________ 19___.
equipment name

8. Additional information: ____

____

____

Signatures of persons composing the report:

Representative of recipient ______________________________________
family name, name, patronymic, position

Representative of recipient ______________________________________
family name, name, patronymic, position

Representative of disinterested organization ________________________
Fam. name, name, patr., position

Enclosure ____

8945
CSO: 1822

ELECTRIC POWER

BRIEFS

PRIMORSKIY KRAY HIGH-VOLTAGE LINE--A 500 kV, split-phase type high voltage line from Primorskaya GRES to Dal'novostochnaya substation is under construction in Primorskiy kray. It will be 364 kilometers long and will use 1,123 metal supports, to include gantry-type intermediate supports and single-column type anchor towers. The line will be constructed in two stages. The first stage, to be completed by 10 December 1980, will run 135 kilometers to Lesozavodsk and carry 220 kV. During 1981-82 the second stage will be constructed and will run to the Dal'novostochnaya substation, the first in Primorskiy kray and the second in the Far East. [Summary] [Vladivostok Maritime Service in Russian to the Pacific Far East 0710 GMT 25 Mar 80] Most of Primorskiy kray's electric power transmission lines are of 220 and 110-kilo-volt capacity but to convey the energy of the power unit to the kray's southern part a 500-kilovolt power line was needed. Restrictions and additional regulatory measures were introduced at kray enterprises because there is not enough electric power to satisfy the evening and morning loads with existing power capacities in autumn and winter during the 1979-80 period. This line, under construction by some 18 rayons and cities, will make it possible to lift these restrictions and to increase the use of electric energy in industry and agriculture. The rate of construction, however, leaves much to be desired due to organizational confusion. The Soyuzvzryv-prom has stopped all drilling and blasting work because it has run out of explosives; Glavdalstroy has failed to provide two promised excavators; Dalmorgidrostroy and the Remstroy Trust of the Far Eastern Shipping Company have not supplied bulldozers; and problems have arisen in the transportation of workers, vehicle maintenance, and provision of every day services. [Excerpts] [Vladivostok Domestic Service in Russian 0235 GMT 26 Mar 80]

CSO: 1822

UDC 622.24:658.5

SAKHALIN GAS-EXPLORATION DRILLING BRIGADE LAUDED

Moscow GAZOVAYA PROMYSHLENNOST', SERIYA: GEOLOGIYA, BURENIYE I RAZRABOTKA GAZOVYKH MESTOROZHDENIY EKSPRESS-INFORMATSIYA in Russian No 2, 1980 pp 1-8

[Article by N. Negrun (Sakhalinburgazrazvedka): "Drilling More Meters Than Called for by the Plan"]

[Text] Drillers of the Sakhalinburgazrazvedka [Sakhalin Production Administration for Gas-Exploration Drilling] were assigned the responsible task of drilling prospecting and exploratory holes in 1979. The collective of the drilling brigade under foreman A. K. Takhtarov made a great contribution to the solution of these most important tasks. This brigade's collective has systematically overfulfilled plan tasks during the Tenth Five-Year Plan and won prize positions in the competition of VPO Sakhalinmorneftegazprom [All-Union Sakhalin Offshore Oil and Gas Industry Production Administration] brigades.

For about 2 years the brigade has been working in the Mong' area. During this time, the oil and gas drillers, sustaining the initative of the drilling brigade of foreman P. P. Kas'yanov of the Tungorsk UBR [drilling administration] to complete the five-year plan ahead of time and to master the Mong' deposits as rapidly as possible, drilled eight holes. Most of them ahead of schedule.

Heightening the pace of drilling work, the brigade's collective has achieved still higher technical and economic indicators. The drillers reached the goal for four years of the Tenth Five-Year Plan ahead of schedule (on 5 June 1979). With an annual task of 8,800 meters and a commitment of 9,200 meters, in 9 months the brigade drilled 8,152 meters of rock, operating costs per meter of penetration was reduced by 26.8 rubles below the plan, and productive time was actually 92 percent versus a commitment of 80 percent.

The brigade is now drilling well No 32 in the Mong' area. This is the ninth well to the credit of the advanced collective of drillers at this field.

The observance of operating and technological discipline in accomplishing current production tasks and meeting the critical-path schedule for speedy well-drilling plays a major role in this brigade's successful drilling of holes.

The drilling brigade hauled the equipment from the completed hole to the new hole and assembled the equipment jointly with the VMK brigade collective. As a result, the time spent hauling and assembling the equipment was reduced to 12-15 days. Thus, the transit, disassembly and reassembly of the equipment and preparation for drilling at Mong' hole No 35 took 15 days (the drilling of Mong' hole No 36 ended on 19 April, and the drilling of hole No 35 started 19 May).

The critical-path schedule for drilling hole No 36 was set for 76 days, while the actual drilling time was 39 days. The effective drilling speed was 1,515 m/st-mes [meters per rig per month] under a plan for 1041, and production time was actually 92.4 percent versus a commitment for 80 percent. The operating costs for the drilling work on this hole was reduced by 143,000 rubles.

The brigade, in drilling all wells in the Mong' area, observed the optimal drilling regime parameters that were stipulated by the operating-regime flow charts, which were compiled on the basis of the results achieved at neighboring holes, which use advanced drilling technology. In particular, mobile configurations for the lower end of the drill string, including eccentric adapters in combination with calibrators, were worked out in detail and provided. More complete development of AN-series bits with achievement of the jet effect has enabled the mechanical speed of penetration per bit to be greatly increased. It averaged 65-70 meters at holes Nos 35 and 36 of the Mong' area, at a time when the figure was one-third less throughout the association.

The brigade achieved its best results when drilling the 2,500-meter exploratory hole No 36 in the Mong' area. Drilling was done by the rotary method with a Uralmash-5D rig.

Drilling with a string 245 mm in diameter was executed by 295 MG bits with use of the jet effect, with the following drilling parameters: load on the bit was brought up to 28 tons and rotor rotating speed was 60-70 rpm at a pump productivity of 45 hp and a pressure of 100-110 kg-force/cm^2.

In order to prevent deviation of the wellbore, the configuration of the drill string's lower end was: a bit 295 mm in diameter, a UBTS [drill collar stabilizer] of 245 mm and 10 meters long, an eccentric adapter, a calibrator, a UBT [drill collar] of 203 mm and 10 meters long, and a UBT of 203 mm and 180 meters long. This configuration enabled the vertical bore to be practically maintained and working of the wellbore during descent of the 245 mm diameter string to be avoided.

Further drilling of the hole to the designed level was accomplished with MSGVSh bits of the following configuration: a 215.9 MGVSh bit, a UBT of

146 mm and 10 meters long, an eccentric adapter, a calibrator 214 mm in diameter, a UBT of 146 mm and 220 meters long, using the following parameters for drilling: a load on the bit of up to 18 tons, a rotor rotating speed of 70-80 rpm with a pump productivity of 30 hp and a pressure of 100-110 kg-force/cm^2.

In order to improve the condition of the bore, to avert accidents and to prevent catching of the drilling tool, especially during drilling in the permeable strata of the Dagna suite, the configuration included antgripping adapters located uniformly every 50 meters along the UBT's length. Each month, on schedule, ultrasonic defectoscopy of the drilling tool was conducted.

Hole-drilling was based on mud with a density of 1.13-1.14 g/cm^3, a viscosity of 25-30 cs and a water loss of 4.5 cm^3 each 30 minutes. All chemical treatment was done on a monthly operating schedule. In order to increase the bit bearing's wear resistance, lubricating additives--13-15 percent oil and 1-2 percent powdered silver graphite--were introduced into the drilling mud.

In order to cut the time spent on round-trip operations and on expanding the wellbore during drilling and core recovery in productive horizons, a pilot reamer was used that rationalizers B. M. Duzinkevich, A. D. Yershov and Yu. N. Kashpor of RITS-2 [Regional Engineering and Technical Services No 2] of the Sakhalinburgazrazvedka production association fabricated from a calibrator 214 mm in diameter; later it was surface hardened, reinforced and installed atop a Nedra device.

The core is recovered by 6 VK 190/80 SZ bits and the Nedra apparatus.

The pilot reamer can be made from a worn KUK 212.7 bit by boring out the internal diameter of the reamer's bore and replacing the teeth that have fallen out.

The proposed pilot reamer enabled the time required for expanding the wellbore to be greatly reduced and, simultaneously, it enabled drilling with continuous core recovery to be conducted in the productive horizon.

Savings from the use of the pilot reamers at Mong' area wells were 34,000 rubles.

While holes are being drilled, the productive horizons are tested with KII-146 M drill stem testers.

The whole collective of the brigade and the regional engineering and technical services constantly work to put technical innovations and rationalizers' suggestions into production that are aimed at raising labor productivity, mechanizing labor-intensive processes and creating safe working methods. In the past 2 years of the Tenth Five-Year Plan alone the economic benefit from rationalizers' suggestions introduced into operation yielded the brigade collective more than 14,000 rubles.

The suggestion of the creative rationalizers' group made up of foreman A. K. Takhtarov, senior production engineer Yu. N. Kashpor, driller V. Kim and drill-rig servicing mechanic N. I. Yerokin, "Rebuilding the Place of Attachment of the Fast Line End of the Block-and-Tackle System on the U2-4-8 Draw Works," enabled the block-and-tackle system to be used to the maximum and to be protected at the place of attachment. The economic benefit was 4,298 rubles.

In order to clean the collector of the settlement's water pump station, rationalizer S. K. Kuz'menko proposed an attachment that protects the pipe from icing up and has produced an economic benefit of about 600 rubles.

With a view to preventing interruptions of the cathead line during drilling and to cutting the worktime spent repairing it, a "cathead wear preventer" was fabricated; the savings were 672 rubles.

For purposes of higher quality in cooling internal combustion engines, rationalizers N. A. Khorokhorin, V. Ya. Agnyun and A. K. Takhtarov changed the design of the existing radiators, installed an additional radiator of their own design with a pipe of large cross-section and changed the diameters of the inlet orifices. The introduction of this suggestion enabled more than 460 rubles to be saved.

Important prerequisites to highly productive work are the correct organization of work and better engineering support of operations.

The brigade's collective, which consists of 28 personnel, was divided into watches. This will enable rational assignment of the watches, and, within them, of various workers, taking into account their available skills and experience and a full workload for each member of the collective. In charge of the watches are experienced drillers S. K. Kuz'menko, G. A. Baskachev, V. Kim and V. S. Yagupov. They, jointly with trade-union organizer M. M. Kondakov and public inspector for accident prevention N. I. Yerokin, will help the drilling foreman in every way possible on many questions of production, in providing for work safety, and in organizing socialist competition within the collective. As a result, the foreman will have more time to solve production questions that are common to the whole collective.

The experience and skill of brigade members are telling where such a procedure is set up: nonproductive worktime expenditures are considered ChP's [extraordinary occurrences]. The collective is conducting the entire well-construction operation strictly in accordance with the plan. Back at the start of the year, measures were developed jointly with specialists of the regional engineering and technical service for achieving the goals contemplated by the collective. They incorporated administrative guarantees (to provide the drillers with everything necessary on time) and the brigade's commitments (to work effectively and with high work quality). Such an approach to the job will enable idle time and other nonproductive time expenditures to be avoided. The workers are striving to use it wisely. Operations that can be combined without

violating the operating process are carried out concurrently. Thus, during mechanical drilling, the washing fluid is treated, drill pipe is prepared for connection, current repair and preventive maintenance of equipment not in use are performed, and loading and unloading work is done. Casing string is prepared and placed on the pipe rack during drilling. Time for installing the blowout preventer is cut to 24-30 hours after the casing string has been lowered, cemented and pressure tested through mounting the branch pipes during preparation of the wellbore for lowering and cementing of the string and while waiting for the cement to harden.

Each watch turns over the shift to its comrades in accordance with a rule that has been established in the brigade: "Give to the watch better than what was received."

Work organization has been made very difficult in the North Sakhalin environment because of the lack of permanent roads, remoteness, severe natural and climatic conditions, and the provisioning of supplies and equipment. Cases have occurred where it was not possible to replace the shift in time. Watches at the Mong' area, which are 260 km from the main base, are dispatched by helicopter. In spite of everything, the communist labor brigade's collective works selflessly and with full exertion of effort.

Well-organized socialist competition and businesslike rivalry, based upon constant exchange of advanced experience and upon mutual comradely support, will be of great help to them in the work.

As is known, socialist competition is not a spontaneous process--it must be possible to enlist the workers in creativity in production and to organize competition of the masses. A creative atmosphere in the collective is important to the successful labor of each worker. It is begun with the foreman, because success depends greatly upon how correctly the brigade's work has been organized and how precisely responsibilities have been distributed. A. K. Takhtarov tries to manage his small collective in such a way that each brigade member will feel his personal responsibility for the matter charged to him and will be able to find correct solutions for various production problems independently without looking around for the foreman.

He stimulates a lively interest in the competition by his own personal example, his authority and his constant quest for and introduction of advanced work methods. For it is the foreman who is in constant, direct association with the workers; if this contact is strong and if the workers trust and understand the foreman, the results of the whole brigade's work will be high.

A competition among the watches was organized within the brigade. All watches struggle to achieve the greatest penetration, high work quality, savings and economies, and they participate in competition for the title, "Best Watch of the Brigade."

Each achievement and each shortfall in the brigade becomes known at once to all. Flyer leaflets, meetings, and even smoking breaks are used for this purpose. The results of the watches' daily work are posted on the Indicators' Board. The winners among the watches are determined once each month. In determining the standings, not only penetration but discipline, constant work safety and other indicators are also considered.

An attempt is made in the brigade to see to it that all watches are equivalent in level of knowledge and in work skills. When the watches are of equal strength, then the competition among them is more interesting, and the production process also goes on smoothly.

A. K. Takhtarov, who possesses many character traits that are inherent in a leader, sets the work pace himself to a great extent. He is an exacting and skil'ful organizer and instructor, and he achieves unswerving fulfillment of all the work safety rules and strict observance of the well-drilling technology and labor and production discipline. His exactingness is combined with skill in listening to the opinions of his comrades about the work, and he extends timely assistance and suggests the correct solution.

It is easy to work with Anver Kashafovich. Mainly extraordinary conscientiousness, a consciousness of responsibility for the matter entrusted to him, and skillfulness in working with people help him. "He is a member of the party bureau and knows how to organize civic work," says the RITS-2 chief. "It is no accident that most brigade members are active members, under the foreman, of the people's control activity."

All the members of the post that driller communist S. K. Kuz'menko heads have specific missions. Thus diesel operator V. I. Korotkiy monitors the use of fuels and lubricants, driller V. Kim the preservation of drilling equipment and tools. A. K. Takhtarov follows up on operation of the equipment, selection of the rational drilling regime, and quality of the drilling mud. The post's patrols constantly check at the Mong' area on the use of transport and the consumption of casing and drill pipe and fuels and lubricants. Oilfield workers, transport workers, well pluggers and construction workers are told the results of the checks. Joint conferences are held on the results of the checks, at which measures aimed at eliminating the deficiencies are determined.

All the patrol's members are taught in accordance with the program of the school for people's controllers that was established in the Sakhalinburgazrazvedka Association and are constantly familiarized with the decrees of All-Union, RSFSR, oblast and city committees of people's control.

The post publicizes its work in a people's control leaflet that is issued regularly to the drill rig.

When the foreman has to be absent from the brigade, he calmly leaves the drill rig to experienced driller S. K. Kuz'menko. He is an energetic man, and a good specialist and organizer. He was a student of the latest

course of the Sakhalin Tekhnikum of the Oil and Gas Industry. He willingly shares his knowledge with his comrades in the brigade, and he has repeatedly been elected a member of the local committee and the permanently operating production conference. He has introduced many valuable suggestions aimed at improving working conditions. The watch that he supervises is in the lead not only in [illegible] but also in the All-Union Production Association Sakhalinmorneftegazprom.

V. K. Kuz'menko was awarded the Order of Labor Glory, 3d Degree, the Order of the Emblem of Honor and the Medal for Labor Valor--for irreproachable work in honoring the occasion of the 100th Anniversary of the Birth of V. I. Lenin--and the emblems Socialist Competition Winner for 1973, 19[illegible] and 1977 and Shock Worker of the Ninth Five-Year Plan.

Diesel operator N. A. Khorokhorin has been toiling in the oil industry for more than 21 years. He has repeatedly been awarded honorary certificates, valuable gifts and monetary bonuses for good production work and for participation in socialist competition.

The collective of foreman A. K. Takhtarov's brigade is competing with foreman V. S. Maksutov's brigade. The results are summed up monthly. Both brigades are drilling over the [illegible] field and are operating under practically equal conditions. This labor competition is a guarantee of new successes.

The movement under the slogan, "Work Without Lags," that is being promoted in the collective is helping the labor upsurge greatly.

The requirement, "Make a promise--carry it out," has become an inflexible law for the brigade. And these rules and this law of life for the brigade is a reliable guarantee that they will make a great contribution to a further rise in the pace of exploration for oil and gas wells in Sakhalin and will complete the Tenth Five-Year Plan in worthy fashion. As has become well known, the collective of A. K. Takhtarov's brigade was in first place in work results among the association's drilling brigades during the third quarter of 1979.

11409
CSO: 8144/0879

UDC 621.311.28

MOBILE POWER, HEAT GENERATOR DESIGNED FOR REMOTE ACTIVITIES

Moscow GAZOVAYA PROMYSHLENNOST', SERIYA: GEOLOGIYA, BURENIYE I RAZRABOTKA GAZOVYKH MESTOROZHDENIY EKSPRESS-INFORMATSIYA in Russian No 2, 1980 pp 14-18

[Article by V. D. Starichenko (Trust for Mobile Electric-Power Plants) and D. M. Natanzon (VNIIST [All-Union Scientific-Research Institute for the Construction of Arterial Pipelines]): "The GTEK-2500-2.5A Mobile Gas-Turbine Energy-Generating Complex"]

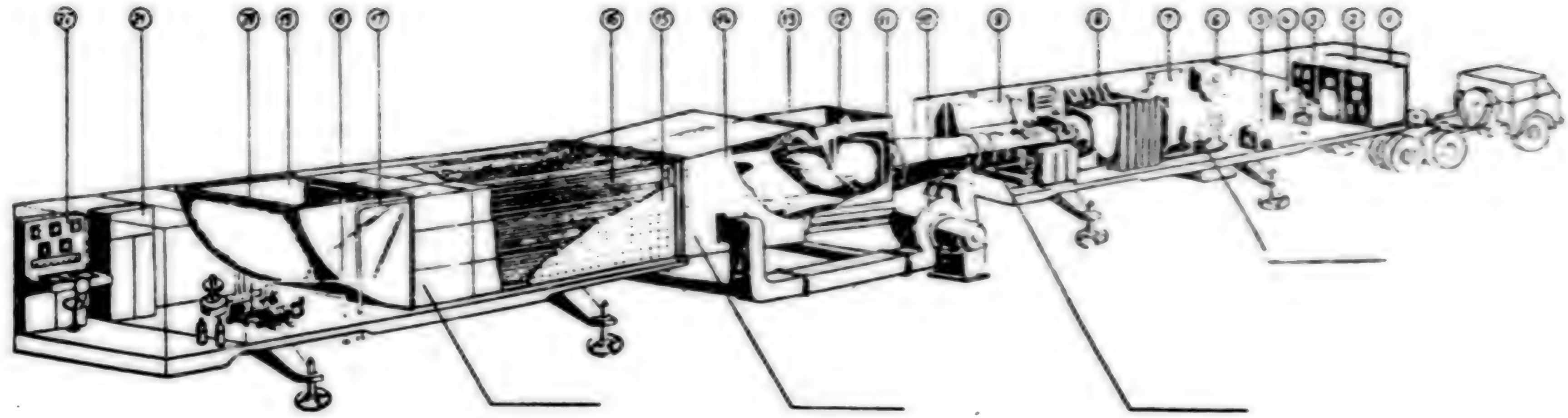
[Text] Right now the problem of saving fuel resources is becoming especially urgent. The wide introduction of gas-turbine installations into power engineering requires the use of waste-heat installations that utilize the heat of exhaust gases. A property of the heat process of gas-turbine installations causes high temperature of the exhaust gases, and this temperature rises steadily as gas-turbine engines are improved by raising the permissible initial temperature of the gas ahead of the high-pressure turbine. Modern domestic gas-turbine engines used in power-engineering have an exhaust-gas temperature at the 350-500 degree C level.

The mobile GTEK-2500-2.5A energy complex is intended for the simultaneous generation of electricity and heat in areas distant from fixed power sources and energy systems. It can be used in the gas, oil and mining industries and other branches of the national economy to supply electricity for industrial and household needs, for covering peak loads, and for a reserve supply of electricity, simultaneously producing hot water for operating needs and supplying heat for personnel uses.

The engineering solution was based on the idea of uniting a mobile gas-turbine electric-power plant of 2,500-kw capacity of the PAES-2500 type with a waste-heat unit in one transportable installation.

The figure shows a general view of the energy complex.

The most important component of the power unit is the waste-heat boiler, which, aside from generating heat, fulfills the function of a noise suppressor at the engine's exhaust outlet cut-off.



The GTEK-2500-2.5A Mobile Gas-Turbine Energy-Generating Complex

1. Cabinet with transformer for the complex's needs.
2. Relay cabinet.
3. Cabinet with high-voltage circuit breaker.
4. Control panel.
5. Startup unit.
6. Thyristor exciter installation.
7. Startup system panel.
8. Noise suppressor.
9. Oil distribution unit.
10. Forced-draft fan.
11. Adapter.
12. Inlet slide.
13. Sprayers (jets).
14. Spray chamber (premix chamber).
15. Noise-suppressing cassette.
16. Radiator.
17. Hot gas exit pipe.
18. Cold water inlet pipe.
19. Chamber for exit of gases.
20. Pump group.
21. Power cabinet.
22. Heat-exchanger control panel.

The waste-heat boiler provides for the generation of heat jointly with operation of the PAES-2500 power plant through use of the heat of the engine's exhaust gases, and also independently of the power plant's operation by burning fuel in a special diffuser, which is equipped with a combustion chamber and fans.

The heat-generating portion of the power unit is mounted in a metal framework, the fabrication of which is based upon a rubber-tired semitrailer. In the operating position, the weight of the heat generator's body rests on four jacks. It has been outfitted with two forced-draft fans with electric drive, from which air enters along special ducts into the spray chamber in order to provide for the generation of heat when the power plant is not operating. The fans and ducts are mounted to the side of the adapter installation.

The heat generator proper consists of an adapter installation, which is a diffuser with built-in inlet slide with electric drive, a spray chamber equipped with eight sprayers (jets), and connections for joining the fan ducts. In the spray chamber, air from the fans is divided into two streams. The primary air provides for combustion of the fuel in the spray chamber, the secondary air for cooling the combustion products that emerge from the premix chamber to a temperature approximately equal to the temperature of the exhaust gases--500 degrees C--of the electric-power plant's gas-turbine engine. The waste-heat boiler proper, which is a horizontal water-tube heat exchanger equipped with externally ribbed tubes, is located behind the combustion chamber. The water to be heated passes inside the tubing, while the outside of the tubes is washed by the flow of hot gases that come from the exhaust outlet of the gas-turbine engine or from the diffuser with premix chamber (when the electric-power unit is not operating). The noise suppression cassette is installed along the path of the gases, behind the pipe bundle.

The exhaust gases, upon passing the noise-suppression cassette, enter the exhaust turn pipe outlet and are discharged vertically into the air. Below, under the turn outlet, two feed pumps with electric drive and the necessary shut-off fixtures have been installed. A power cabinet for the auxiliary equipment and a control panel for the heat generator with an operator's workplace have been placed in the last compartment, which is separated from the operating equipment by a thermally insulated partition.

The heat generator works on the following principle:

Exhaust gases from the engine's outlet enter the diffuser, which raises their pressure to the value needed to overcome the hydraulic resistance of the heat exchange and the noise suppressor. The heat productivity is regulated, with a view to reducing this regime, by a butterfly valve (with electric drive), through which part of the exhaust gases is admitted into the atmosphere through a special exhaust chamber that is installed on the diffuser's roof.

An increase in heat productivity at a partial-load regime (or, during the winter, when the air temperature is low) can be provided in case of necessity by burning additional fuel (lit from below) in the premix chamber without engaging the fans. The aerodynamics of the premix chamber provide for cooling the combustion products to a temperature that permits the tubes used in the heat exchanger to be made from inexpensive carbon or low-alloy steels.

The most economical operation of the energy complex is provided under the nominal load regime of the electric-power plant and heat generator, with an overall heat-utilization efficiency of about 45 percent.

When the electric-power plant is not operating, in case there is no requirement for electricity, or when the plant is down for repair, the heat generator can operate independently by burning fuel in the premix chamber with the forced-draft fans in operation. The heat productivity under this regime is regulated by the operator, who sets the required consumption of fuel and water through the heat exchanger.

The waste-heat boiler is simultaneously an effective noise suppressor. The first stage of noise suppression is the heat exchanger's pipe bundle (made of ribbed tubing), the second stage is the special cassette of a finned noise suppressor. The noise level is reduced on exit from the heat generator to the permissible health norms.

Specifications

Power, nominal, kw......................................	2,500
Power, maximal (short-term operation), kw..............	2,750
Heat productivity, nominal, Gcal/hr....................	2.5
Heat productivity, maximal, Gcal/hr....................	3.0
Nominal efficiency of the installation (overall), %....	45
Type of heat-recovery boiler...........................	horizontal water-heating
Type of noise suppressor...............................	honeycomb-finned
Volume of water heated (from +5 to +90 degrees C), m^3/hr..	35
Fan productivity, m^3/hr.............................	$70 \cdot 10^3$
Fuel..	diesel, kerosene, natural gas, or casing-head gas
Hourly fuel consumption at the nominal regime, no more than, kg/hr..	1,100
Oil for the gas-turbine engine.........................	a mix of 75% transformer or MK-8 oil and 25% MK-22 or MS-20 oil, by volume
Hourly oil consumption by the engine, kg/hr............	1.0
Time required to reach full electrical load, no more than, min...	5

Start	automatic
Dimensions (in the operating position), mm:	
Length	27,500
Width	2,800
Height	4,100
Weight, tons	50
Cost per kw of installed capacity (approximately), rubles per kw/hr	60

The equipment of the energy complex is placed on two semitrailers that are transported by truck tractor or by rail, water or air transport.

In order to provide for continuous and reliable operation of the heat exchanger, the energy complex should be equipped with a separate unit for treating water. Since the productivity of the water-treatment unit and the technology for processing the water depend upon specific local conditions, and also upon the heat-supply scheme (the ratio in percent of the water returned and of the water not returned), a standard water-treatment unit is not being produced. The water-treatment unit is designed when a specific design for an installation and the tie-in of the energy complex is being developed, which will depend upon the quality of the local water and upon the hot-water supply scheme.

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END

SELECTIVE LIST OF JPRS SERIAL REPORTS

USSR SERIAL REPORTS (GENERAL)

USSR REPORT: Agriculture
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USSR REPORT: Military Affairs
USSR REPORT: Political and Sociological Affairs
USSR REPORT: Energy
USSR REPORT: International Economic Relations
USSR REPORT: Consumer Goods and Domestic Trade
USSR REPORT: Human Resources
USSR REPORT: Transportation
USSR REPORT: Translations from KOMMUNIST*
USSR REPORT: PROBLEMS OF THE FAR EAST*
USSR REPORT: SOCIOLOGICAL STUDIES*
USSR REPORT: USA: ECONOMICS, POLITICS, IDEOLOGY*

USSR SERIAL REPORTS (SCIENTIFIC AND TECHNICAL)

USSR REPORT: Life Sciences: Biomedical and Behavioral Sciences
USSR REPORT: Life Sciences: Effects of Nonionizing Electromagnetic Radiation
USSR REPORT: Life Sciences: Agrotechnology and Food Resources
USSR REPORT: Chemistry
USSR REPORT: Cybernetics, Computers and Automation Technology
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USSR REPORT: Physics and Mathematics
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE*

WORLDWIDE SERIAL REPORTS

WORLDWIDE REPORT: Environmental Quality
WORLDWIDE REPORT: Epidemiology
WORLDWIDE REPORT: Law of the Sea
WORLDWIDE REPORT: Nuclear Development and Proliferation
WORLDWIDE REPORT: Telecommunications Policy, Research and Development

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7 May '80

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